

IN THE CLAIMS

Please amend the claims as follows:

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1. (Previously Presented) A method for providing pacing therapy to a heart, comprising:  
establishing discrimination criteria for distinguishing at least two different types of supraventricular tachycardia having regular rapid supraventricular heart rates;  
sensing activity of at least one atria of the heart to provide an atrial activity signal;  
comparing at least one characteristic of the atrial activity signal to the discrimination criteria to identify one of the at least two different types of supraventricular tachycardia having regular rapid supraventricular heart rates; and  
controlling pacing of the heart in a first manner for an identified first one of the at least two different types of supraventricular tachycardia and in a second manner for an identified second one of the at least two different types of supraventricular tachycardia.
  2. (Canceled)
  3. (Previously Presented) The method of Claim 1 wherein establishing discrimination criteria includes establishing criteria for distinguishing between fast atrial flutter and a slower rate supraventricular tachycardia.
  4. (Previously Presented) The method of Claim 3 wherein establishing discrimination criteria includes establishing criteria for distinguishing between fast atrial flutter at a first high rate and a second atrial flutter at a second lower rate.
  5. (Previously Presented) The method of Claim 1 wherein establishing discrimination criteria includes establishing rate-based discrimination criteria for distinguishing between different types of supraventricular tachycardia and wherein comparing at least one characteristic of the atrial activity signal to the discrimination criteria includes comparing a rate of the atrial activity signal to the discrimination criteria.

6. (Previously Presented) The method of Claim 1 wherein establishing discrimination criteria includes establishing morphology-based discrimination criteria for distinguishing between different types of supraventricular tachycardia and wherein comparing at least one characteristic of the atrial activity signal to the discrimination criteria includes comparing a morphology characteristic of the atrial activity signal to the discrimination criteria.

7. (Previously Presented) The method of Claim 1 wherein establishing discrimination criteria includes establishing a multi-dimensional threshold function, and wherein comparing at least one characteristic of the atrial activity signal to the discrimination criteria includes comparing a combination of a plurality of statistics calculated from a set of depolarization intervals determined from the atrial activity signal to the threshold function.

8. (Previously Presented) The method of Claim 1 further comprising monitoring an effect of controlling pacing of the heart and automatically adjusting the discrimination criteria in response thereto.

9. (Previously Presented) The method of Claim 1 wherein controlling pacing of the heart includes providing atrial antitachycardia pacing to the heart for the identified first one of the at least two different types of supraventricular tachycardia or a second type of pacing control for the identified first one of the at least two different types of supraventricular tachycardia.

10. (Previously Presented) The method of Claim 9 wherein the second type of pacing control is ventricular pacing.

11. (Previously Presented) The method of Claim 10 wherein the second type of pacing control is selected from the group of pacing controls consisting of ventricular rate regulation and Rate Smoothing.

12. (Previously Presented) The method of Claim 1 wherein comparing at least one characteristic of the atrial activity signal to the discrimination criteria includes applying an atrial discrimination algorithm to the atrial activity signal to produce an atrial discrimination algorithm output value indicative of the type of supraventricular tachycardia occurring.

13. (Previously Presented) The method of Claim 12 comprising additionally trending a plurality of atrial discrimination algorithm output values and controlling timing of the pacing of the heart in a manner corresponding to the identified one of the at least two different types of supraventricular tachycardia in response to the trend of the atrial discrimination algorithm output values.

14. (Previously Presented) A method for providing pacing therapy to a heart, comprising :

- establishing discrimination criteria for distinguishing between regular rapid supraventricular heart rates, the regular rapid supraventricular heart rates including fast atrial flutter and a slower rate supraventricular tachycardia;
- sensing activity of at least one atria of the heart to provide an atrial activity signal;
- comparing at least one characteristic of the atrial activity signal to the discrimination criteria to identify whether a sensed regular rapid supraventricular heart rate is a fast atrial flutter of a slower rate supraventricular tachycardia; and
- controlling pacing of the heart to provide atrial antitachycardia pacing to the heart if a slower rate supraventricular tachycardia is identified as occurring and providing a second type of pacing control if a fast atrial flutter is identified as occurring.

15. (Previously Presented) The method of Claim 14 wherein establishing discrimination criteria includes establishing criteria for distinguishing between the fast atrial flutter at a first high rate and a second atrial flutter at a second lower rate.

16. (Previously Presented) The method of Claim 14 wherein establishing discrimination criteria includes establishing rate-based discrimination criteria for distinguishing between fast atrial flutter and a slower rate supraventricular tachycardia and wherein comparing at least one

characteristic of the atrial activity signal to the discrimination criteria includes comparing a rate of the atrial activity signal to the discrimination criteria.

17. (Previously Presented) The method of Claim 14 wherein establishing discrimination criteria includes establishing morphology-based discrimination criteria for distinguishing between fast atrial flutter and a slower rate supraventricular tachycardia and wherein comparing at least one characteristic of the atrial activity signal to the discrimination criteria includes comparing a morphology characteristic of the atrial activity signal to the discrimination criteria.

18. (Previously Presented) The method of Claim 14 wherein establishing discrimination criteria include establishing a multi-dimensional threshold function, and wherein comparing at least one characteristic of the atrial activity signal to the discrimination criteria includes comparing a combination of a plurality of statistics calculated from a set of depolarization intervals determined from the atrial activity signal to the threshold function.

19. (Previously Presented) The method of Claim 14 further comprising monitoring an effect of controlling pacing of the heart, and automatically adjusting the discrimination criteria in response thereto.

20. (Previously Presented) The method of Claim 14 wherein the second type of pacing control is ventricular pacing.

21. (Previously Presented) The method of Claim 20 wherein the second type of pacing control is selected from the group of pacing controls consisting of ventricular rate regulation and Rate Smoothing.

22. (Withdrawn) A method for distinguishing between different types of rapid regular supraventricular tachycardia, comprising:

establishing an atrial discrimination algorithm including discrimination criteria for distinguishing different types of rapid regular supraventricular tachycardia;

sensing activity of at least one atria of the heart to provide an atrial activity signal;

determining that an atrial rate is above a predetermined atrial tracking rate for performing ventricular pacing such that the atrial rate is higher than the ventricular rate;

in response to determining that the atrial rate is above the predetermined atrial tracking rate, applying the atrial discrimination algorithm to the atrial activity signal to compare at least one characteristic of said atrial activity signal to the discrimination criteria to identify a type of rapid regular supraventricular tachycardia occurring; and

providing an indication corresponding to the type of rapid regular supraventricular tachycardia identified.

23. (Withdrawn) The method of Claim 22 wherein establishing an atrial discrimination algorithm includes establishing discrimination criteria for distinguishing between fast atrial flutter and a slower rate rapid regular supraventricular tachycardia.

24. (Withdrawn) The method of Claim 22 wherein establishing an atrial discrimination algorithm includes establishing discrimination criteria for distinguishing between fast atrial flutter at a first high rate and a second atrial flutter at a second lower rate.

25. (Withdrawn) The method of Claim 22 wherein establishing an atrial discrimination algorithm includes establishing rate-based discrimination criteria for distinguishing between different types of rapid regular supraventricular tachycardia and wherein comparing at least one characteristic of the atrial activity signal to the discrimination criteria includes comparing a rate of the atrial activity signal to the discrimination criteria.

26. (Withdrawn) The method of Claim 22 wherein establishing an atrial discrimination algorithm includes establishing morphology-based discrimination criteria for distinguishing between different types of rapid regular supraventricular tachycardia and wherein comparing at least one characteristic of the atrial activity signal to the discrimination criteria includes comparing a morphology characteristic of the atrial activity signal to the discrimination criteria.

27. (Withdrawn) The method of Claim 22 wherein establishing an atrial discrimination algorithm includes establishing a multi-dimensional threshold function, and wherein applying the atrial discrimination algorithm to the atrial activity signal includes comparing a combination of a plurality of statistics calculated from a set of depolarization intervals determined from the atrial activity signal to the threshold function.

28. (Withdrawn) The method of Claim 22 wherein determining that the atrial rate is above the predetermined atrial tracking rate includes establishing a maximum atrial tracking rate, deriving the atrial rate from an atrial activity signal, and comparing the derived atrial rate to the maximum atrial tracking rate, and wherein applying the atrial discrimination algorithm to an atrial activity signal is performed only if the derived atrial rate exceeds the maximum atrial tracking rate.

29. (Withdrawn) The method of Claim 22 further comprising controlling an atrial antitachycardia pacing therapy for a first type of rapid regular supraventricular tachycardia and a ventricular pacing therapy for a second type of rapid regular supraventricular tachycardia.

30. (Previously Presented) A cardiac pacing device, comprising:  
sensing means for sensing activity of at least one atria of a heart;  
signal detection means coupled to the sensing means for generating an atrial activity signal based on the sensed activity of the at least one atria of the heart;  
a pacer for providing pacing pulses to the heart; and  
a processor coupled to the signal detection means for receiving the atrial activity signal and to the pacer for comparing at least one characteristic of the atrial activity signal to discrimination criteria for distinguishing at least two different types of regular rapid heart rates to identify a type of regular supraventricular tachycardia occurring and for controlling the pacer to provide a first pacing therapy to the heart for a first type of regular supraventricular tachycardia and a second pacing therapy to the heart for a second type of regular supraventricular tachycardia.

31. (Original) The cardiac pacing device of Claim 30 wherein the sensing means includes at least one electrode positioned in the heart and wherein the signal detection means is coupled to the electrode by a lead.

32. (Canceled)

33. (Previously Presented) The cardiac pacing device of Claim 30 wherein the discrimination criteria include criteria for distinguishing between fast atrial flutter and a slower rate supraventricular tachycardia.

34. (Previously Presented) The cardiac pacing device of Claim 33 wherein the discrimination criteria include criteria for distinguishing between fast atrial flutter at a first high rate and a second atrial flutter at a second lower rate.

35. (Original) The cardiac pacing device of Claim 30 wherein the discrimination criteria include rate-based discrimination criteria for distinguishing between different types of supraventricular tachycardia and wherein the processor compares a rate characteristic of the atrial activity signal to the discrimination criteria to identify the type of supraventricular tachycardia occurring.

36. (Original) The cardiac pacing device of Claim 30 wherein the discrimination criteria include morphology-based discrimination criteria for distinguishing between different types of supraventricular tachycardia and wherein the processor compares a morphology characteristic of the atrial activity signal to the discrimination criteria to identify the type of supraventricular tachycardia occurring.

37. (Original) The cardiac pacing device of Claim 30 wherein the discrimination criteria include a multi-dimensional threshold function, and wherein the processor compares a combination of a plurality of statistics calculated from a set of depolarization intervals

determined from the atrial activity signal to the threshold function to identify the type of supraventricular tachycardia occurring.

38. (Original) The cardiac pacing device of Claim 30 wherein the processor comprises additionally means for monitoring an effect of controlling the pacer to provide pacing pulses to the heart in a manner corresponding to the type of supraventricular tachycardia identified, and means for adjusting automatically the discrimination criteria in response to the monitored effect.

39. (Previously Presented) The cardiac pacing device of Claim 30 wherein the processor controls the pacer to provide atrial antitachycardia pacing to the heart or a second type of pacing depending upon the type of supraventricular tachycardia identified.

40. (Previously Presented) The cardiac pacing device of Claim 39 wherein the second type of pacing is ventricular pacing.

41. (Previously Presented) The cardiac pacing device of Claim 40 wherein the second type of pacing is selected from the group of pacing controls consisting of ventricular rate regulation and Rate Smoothing.

42. (Previously Presented) The cardiac pacing device of Claim 30 wherein the processor means for comparing at least one characteristic of the atrial activity signal to the discrimination criteria includes means for applying an atrial discrimination algorithm to the atrial activity signal to produce an atrial discrimination algorithm output value indicative of the type of supraventricular tachycardia occurring.

43. (Original) The cardiac pacing device of Claim 42 wherein the processor comprises additionally means for trending a plurality of the atrial discrimination algorithm output values and for controlling the pacer to control timing of the pacing of the heart in response to the trend of the atrial discrimination algorithm output values.



44. (Previously Presented) A cardiac pacing device, comprising:
- sensing means for sensing activity of at least one of the atria of a heart;
  - signal detection means coupled to the sensing means for generating an atrial activity signal based on the sensed activity of the heart;
  - a pacer for providing pacing pulses to the heart; and
  - a processor coupled to the signal detection means for receiving the atrial activity signal and to the pacer for comparing at least one characteristic of the atrial activity signal to discrimination criteria for distinguishing between regular rapid supraventricular heart rates, including distinguishing between fast atrial flutter and a slower rate supraventricular tachycardia to identify whether a fast atrial flutter or a slower rate supraventricular tachycardia is occurring and for controlling the pacer to provide atrial antitachycardia pacing to the heart if a slower rate supraventricular tachycardia is identified as occurring and to provide a second type of pacing if a fast atrial flutter is identified as occurring.
45. (Original) The cardiac pacing device of Claim 44 wherein the sensing means includes at least one electrode positioned in the heart and wherein the signal detection means is coupled to the electrode by a lead.
46. (Original) The cardiac pacing device of Claim 44 wherein the discrimination criteria include criteria for distinguishing between the fast atrial flutter at a first high rate and an other atrial flutter at a second lower rate.
47. (Original) The cardiac pacing device of Claim 44 wherein the discrimination criteria include rate-based discrimination criteria for distinguishing between fast atrial flutter and a slower rate supraventricular tachycardia and wherein the processor compares a rate characteristic of the atrial activity signal to the discrimination criteria to identify whether a fast atrial flutter or a slower rate supraventricular tachycardia is occurring.
48. (Original) The cardiac pacing device of Claim 44 wherein the discrimination criteria include morphology-based discrimination criteria for distinguishing between fast atrial flutter

and a slower rate supraventricular tachycardia and wherein the processor compares a morphology characteristic of the atrial activity signal to the discrimination criteria to identify whether a fast atrial flutter or a slower rate supraventricular tachycardia is occurring.

49. (Original) The cardiac pacing device of Claim 44 wherein the discrimination criteria include a multi-dimensional threshold function, and wherein the processor compares a combination of a plurality of statistics calculated from a set of depolarization intervals determined from the atrial activity signal to the threshold function.

50. (Original) The cardiac pacing device of Claim 44 wherein the processor comprises additionally means for monitoring an effect of controlling the pacer to provide pacing pulses to the heart, and means for adjusting automatically the discrimination criteria in response to the monitored effect.

51. (Previously Presented) The cardiac pacing device of Claim 44 wherein the second type of pacing is ventricular pacing.

52. (Previously Presented) The cardiac pacing device of Claim 51 wherein the second type of pacing is selected from the group of pacing controls consisting of ventricular rate regulation and Rate Smoothing.

53. (Withdrawn) An implantable cardiac device, comprising:  
sensing means for sensing activity of at least one atria of a heart;  
signal detection means coupled to the sensing means for generating an atrial activity signal based on the sensed activity of the at least one atria of the heart;  
a processor coupled to the signal detection means for receiving the atrial activity signal and for applying an atrial discrimination algorithm including discrimination criteria for distinguishing different types of rapid regular supraventricular tachycardia to the atrial activity signal to compare at least one characteristic of the atrial activity signal to the discrimination criteria to identify a type of rapid regular supraventricular tachycardia occurring and for

providing an indication corresponding to the type of rapid regular supraventricular tachycardia identified; and

a pacer for providing pacing pulses to the heart, wherein the processor is coupled to the pacer for controlling the pacer, wherein the pacer is dual chamber bradycardia pacer for providing pacing pulses to ventricles of the heart at a pacing rate based on a detected atrial rate up to a maximum atrial tracking rate and wherein the processor applies the atrial detection algorithm to the atrial activity signal only if the detected atrial rate exceeds the maximum atrial tracking rate.

54. (Withdrawn) The implantable cardiac device of Claim 53 wherein the sensing means includes at least one electrode positioned in the heart and wherein the signal detection means is coupled to the electrode by a lead.

55. (Withdrawn) The implantable cardiac device of Claim 53 wherein the atrial discrimination algorithm includes discrimination criteria for distinguishing between fast atrial flutter and a slower rate rapid regular supraventricular tachycardia.

56. (Withdrawn) The implantable cardiac device of Claim 55 wherein the atrial discrimination algorithm includes discrimination criteria for distinguishing between fast atrial flutter at a first high rate and an other atrial flutter at a second lower rate.

57. (Withdrawn) The implantable cardiac device of Claim 53 wherein the atrial discrimination algorithm includes rate-based discrimination criteria for distinguishing between different types of rapid regular supraventricular tachycardia and wherein the processor compares a rate characteristic of the atrial activity signal to the discrimination criteria to identify the type of rapid regular supraventricular tachycardia occurring.

58. (Withdrawn) The implantable cardiac device of Claim 53 wherein the atrial discrimination algorithm includes morphology-based discrimination criteria for distinguishing between different types of rapid regular supraventricular tachycardia and wherein the processor

compares a morphology characteristic of the atrial activity signal to the discrimination criteria to identify the type of rapid regular supraventricular tachycardia occurring.

59. (Withdrawn) The implantable cardiac device of Claim 53 wherein the atrial discrimination algorithm includes a multi-dimensional threshold function and wherein the processor compares a combination of a plurality of statistics calculated from a set of depolarization intervals determined from the atrial activity signal to the threshold function to identify the type of rapid regular supraventricular tachycardia occurring.

60. (Canceled)

61. (Canceled)

62. (Previously Presented) A cardiac pacing device, comprising:  
at least one sensor to sense atrial activity of a heart;  
a signal detector connected to the at least one sensor to generate an activity signal based on the sensed atrial activity of the heart;  
a pacer for providing pacing pulses to the heart; and  
a processor coupled to the signal detector to receive the atrial activity signal and coupled to the pacer to compare at least one characteristic of the atrial activity signal to discrimination criteria for distinguishing between regular rapid supraventricular heart rates, including distinguishing between fast atrial flutter and a slower rate supraventricular tachycardia to identify whether a fast atrial flutter or a slower rate supraventricular tachycardia is occurring and for controlling the pacer to provide atrial antitachycardia pacing to the heart for an identified slower rate supraventricular tachycardia and to provide a second type of pacing for an identified fast atrial flutter.

63. (Withdrawn) An implantable cardiac device, comprising:  
sensing means for sensing activity of at least one atria of a heart;

signal detection means coupled to the sensing means for generating an atrial activity signal based on the sensed activity of the at least one atria of the heart; and

a processor coupled to the signal detection means for receiving the atrial activity signal and for applying an atrial discrimination algorithm to the atrial activity signal to compare at least one characteristic of the atrial activity signal to discrimination criteria, wherein the atrial discrimination algorithm is adapted to discriminate between a fast atrial flutter at a first high rate and an other atrial flutter at a second lower rate, and wherein the processor is adapted to provide an indication corresponding to an identified ~~on~~ one of the fast atrial flutter at a first high rate and the other atrial flutter at a second lower rate.

64. (Withdrawn) A method for providing therapy to a heart, comprising:

establishing discrimination criteria for distinguishing at least two different types of supraventricular tachycardia having regular rapid supraventricular heart rates;

sensing activity of at least one atria of the heart to provide an atrial activity signal;

determining that an atrial rate is above a predetermined atrial tracking rate for performing ventricular pacing such that the atrial rate is higher than the ventricular rate;

in response to determining that the atrial rate is above the predetermined atrial tracking rate, providing an atrial discrimination therapy output based on the atrial activity signal, including comparing at least one characteristic of the atrial activity signal to the discrimination criteria to identify one of the at least two different types of supraventricular tachycardia having regular rapid supraventricular heart rates; and

providing an atrial anti-tachycardia pacing therapy to the heart for an identified first one of the at least two different types of supraventricular tachycardia and providing a ventricular pacing therapy for an identified second one of the at least two different types of supraventricular tachycardia.

65. (Withdrawn) The method of claim 64, further comprising:

trekking the atrial discrimination therapy output; and

timing a pacing therapy based on the trended atrial discrimination therapy output.

66. (New) A method for providing pacing therapy to a heart, comprising:  
establishing discrimination criteria for distinguishing at least two different types of supraventricular tachycardia having regular rapid supraventricular heart rates;  
sensing activity of at least one atria of the heart to provide an atrial activity signal;  
comparing at least one characteristic of the atrial activity signal to the discrimination criteria to identify one of the at least two different types of supraventricular tachycardia having regular rapid supraventricular heart rates; and  
providing an indication corresponding to the type of regular rapid supraventricular tachycardia identified.

67. (New) The method of claim 66, wherein providing an indication corresponding to the type of regular rapid supraventricular tachycardia identified includes controlling pacing of the heart in a first manner for an identified first one of the at least two different types of supraventricular tachycardia and in a second manner for an identified second one of the at least two different types of supraventricular tachycardia.

68. (New) The method of claim 67, wherein controlling pacing of the heart in a first manner for an identified first one of the at least two different types of supraventricular tachycardia and in a second manner for an identified second one of the at least two different types of supraventricular tachycardia includes controlling pacing of the heart to provide atrial antitachycardia pacing to the heart if a slower rate supraventricular tachycardia is identified as occurring and providing a second type of pacing control if a fast atrial flutter is identified as occurring.

69. (New) The method of claim 67, wherein controlling pacing of the heart in a first manner for an identified first one of the at least two different types of supraventricular tachycardia and in a second manner for an identified second one of the at least two different types of supraventricular tachycardia includes providing an atrial anti-tachycardia pacing therapy to the heart for an identified first one of the at least two different types of supraventricular tachycardia

and providing a ventricular pacing therapy for an identified second one of the at least two different types of supraventricular tachycardia.

70. (New) The method of claim 66, wherein establishing discrimination criteria includes establishing an atrial discrimination algorithm, the algorithm providing discrimination criteria for distinguishing different types of regular rapid supraventricular tachycardia.

71. (New) An implantable cardiac device, comprising:  
means for establishing discrimination criteria for distinguishing at least two different types of supraventricular tachycardia having regular rapid supraventricular heart rates;  
means for sensing activity of at least one atria of the heart to provide an atrial activity signal;  
means for comparing at least one characteristic of the atrial activity signal to the discrimination criteria to identify one of the at least two different types of supraventricular tachycardia having regular rapid supraventricular heart rates; and  
means for providing an indication corresponding to the type of regular rapid supraventricular tachycardia identified.

72. (New) The device of claim 71, further comprising means for providing pacing pulses to a heart, wherein the means for providing an indication controls the means for providing pacing pulses to a heart.

73. (New) The device of claim 71, wherein the means for comparing includes:  
signal detection means coupled to the means for sensing to generate an atrial activity signal based on the sensed activity of the at least one atria of the heart; and  
a processor coupled to the signal detection means for receiving the atrial activity signal and for applying an atrial discrimination algorithm including discrimination criteria for distinguishing different types of rapid regular supraventricular tachycardia to the atrial activity signal to compare at least one characteristic of the atrial activity signal to the discrimination criteria to identify a type of rapid regular supraventricular tachycardia occurring, the processor

including the means for providing an indication corresponding to the type of rapid regular supraventricular tachycardia identified.

74. (New) The device of claim 73, wherein the atrial discrimination algorithm is adapted to discriminate between a fast atrial flutter at a first high rate and an other atrial flutter at a second lower rate, and wherein the processor is adapted to provide an indication corresponding to an identified one of the fast atrial flutter at a first high rate and the other atrial flutter at a second lower rate.

C1 75. (New) The device of claim 73, wherein the means for providing pacing pulses to a heart includes a dual chamber bradycardia pacer for providing pacing pulses to ventricles of the heart at a pacing rate based on a detected atrial rate up to a maximum atrial tracking rate; and the means for providing an indication applies an atrial detection algorithm only if the detected atrial rate exceeds the maximum atrial tracking rate.

76. (New) A method for providing pacing therapy to a heart, comprising:  
sensing activity of at least one atria of the heart to provide an atrial activity signal;  
analyzing the atrial activity signal to discriminate between at least two different types of supraventricular tachycardia having regular rapid supraventricular heart rates;  
providing a first pacing therapy for an identified first one of the at least two different types of supraventricular tachycardia and a second pacing therapy for an identified second one of the at least two different types of supraventricular tachycardia; and  
trending the atrial activity signal to appropriately time at least one of the first and second pacing therapies.

77. (New) The method of claim 76, wherein:  
the first one of the at least two different types of supraventricular tachycardia includes a first atrial flutter at a first rate;  
the second one of the at least two different types of supraventricular tachycardia includes a second atrial flutter at a second rate, the second rate being slower than the first rate;



AMENDMENT AND RESPONSE UNDER 37 CFR § 1.111

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the first pacing therapy includes ventricular pacing; and  
the second pacing therapy includes atrial anti-tachycardia pacing.

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